



# **Armed Forces College of Medicine AFCM**







# **Diseases of kidney**

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Salah***





# **Lecture (3)**

## **Diseases of tubules & interstitium and urinary out flow obstruction**

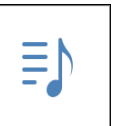


# INTENDED LEARNING OBJECTIVES (ILOs)



**By the end of this lecture the student will be able to:**

1. Determine the etiology of acute pyelonephritis, its clinical picture , pathological features & fate .
2. Mention types of chronic pyelonephritis, its pathological features & complications.
3. Explain the pathogenesis of hydronephrosis, its pathological features and complications.
4. Describe the pathological features of pyonephrosis.
5. Correlate the clinical picture with histopathological features and other laboratory findings in cases of pyelonephritis ,hydronephrosis and pyonephrosis





# Definition Acute pyelonephritis

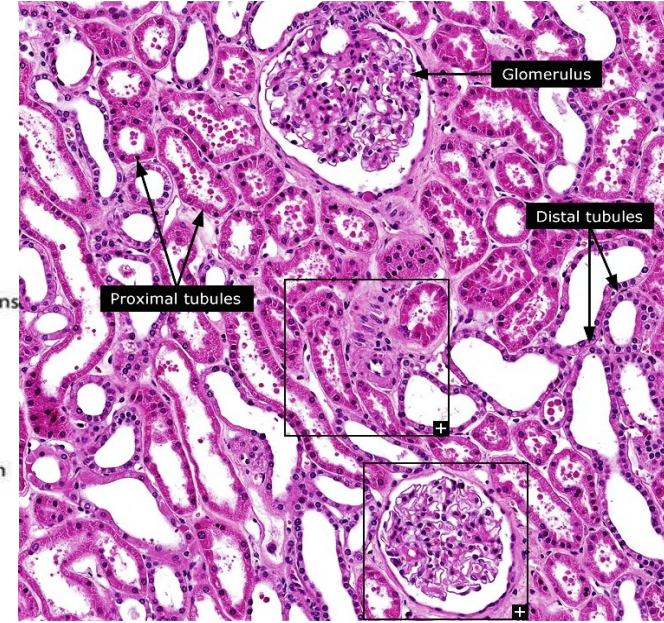
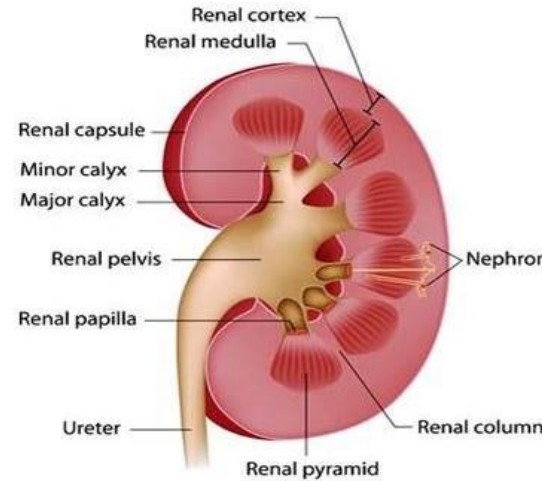
Acute  
inflammation of

❑ **Kidney** (interstitium and tubules)

&

❑ **Renal pelvis**

**Pyelonephritis**



<https://www.pinterest.com/pin/61143408688104382>

is

(Renal pelvis)

**Kidney**

(Interstitium and tubules)

**Inflammation**





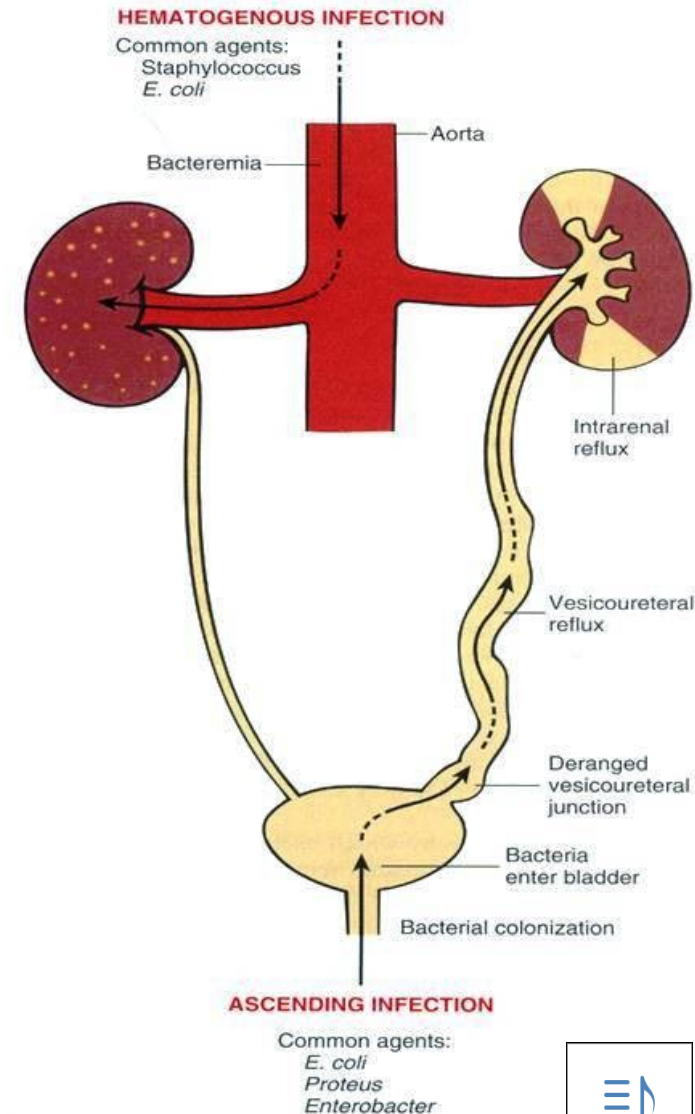
# Acute pyelonephritis

## Causative organisms (BACTERIA)

- E coli (**most common**).
- Proteus, Klebsiella
- Staphylococci , Streptococcus faecalis (**uncommon**)

## Routes of infection

- **Ascending** from the lower urinary tract (**most common**)
- **Hematogenous** as in septicemia (**less common**)
- From colon through intercommunicating **lymphatics**





# Acute pyelonephritis



## Predisposing factors

### 1. Diabetes mellitus

- ❑ Increased susceptibility to infection (low immunity)
- ❑ Neurogenic bladder dysfunction

### 2. Urinary tract **obstruction**

(Benign prostatic hyperplasia, stones, tumours, strictures)

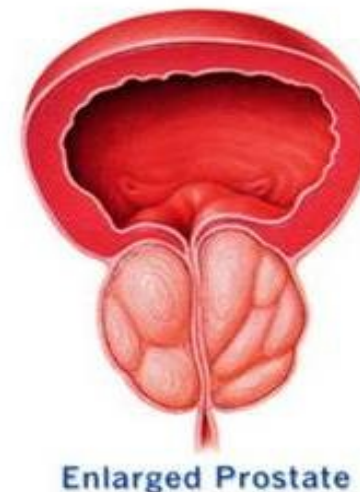
- ❑ Stasis of urine favor bacterial growth

### 3. **Females** (commonly affected)

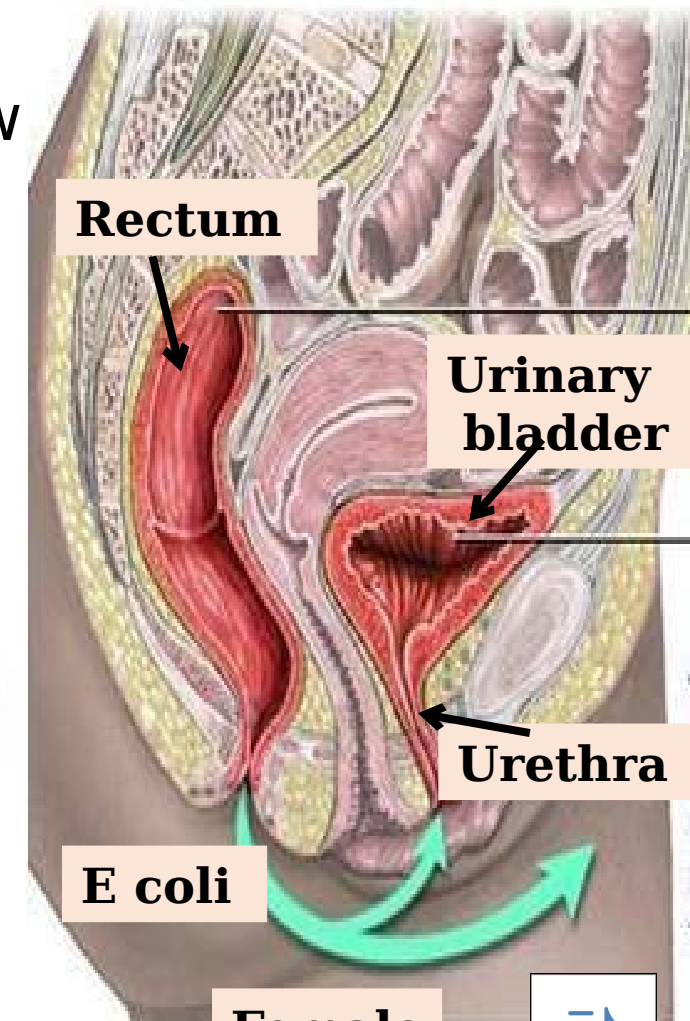
- ❑ *Shorter wider urethra* (easier infectic
- ❑ *Pregnancy* (due to urinary stasis)

### 4. Urethral instrumentation

### 5. Vesicoureteric **reflux** (congenital or ac



Enlarged Prostate



Female



# Clinical features Acute pyelonephritis



- Fever, rigor, pain and tenderness over **loin**

(at costovertebral angle)

**(d.t upper urinary tract infection)**

- Dysuria, frequency , urgency , hematuria

**(d.t lower urinary tract infection)**

- Turbid urine showing: pus, RBC & leucocytic casts



<http://pusat-vitamin-keluarga.blogspot.com/2014/09/kencing-g-kotor-kencing-tak-lawas.htm>



# Acute pyelonephritis

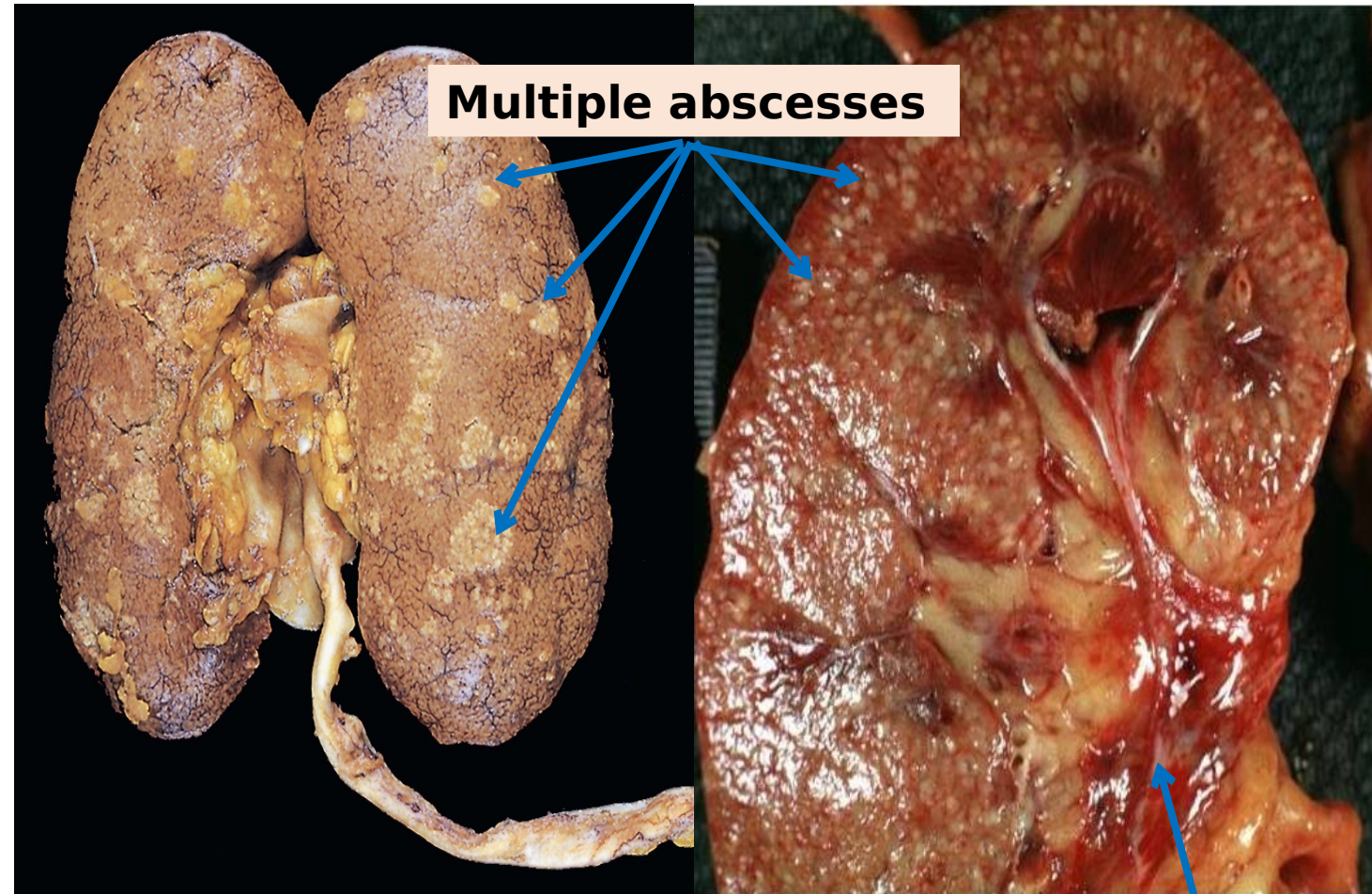


## Gross (commonly bilateral)

1. Kidneys are enlarged
2. Capsule strips easily
3. **Outer surface** and **cut section** show multiple abscesses
4. Mucosa of pelvi-calyceal system is congested and covered by pus

## N.B:

When obstruction is prominent, **pus** accumulates in renal pelvis, calyces &



Multiple abscesses

Outer surface

Cut section

Pus in renal pelvis

Robbins basic pathology

Endocrine and genitourinary module

<https://rltwnf.tistory.com/entry/acute-pyelonephritis>





# Acute pyelonephritis



**Mic:**

**Kidney:**

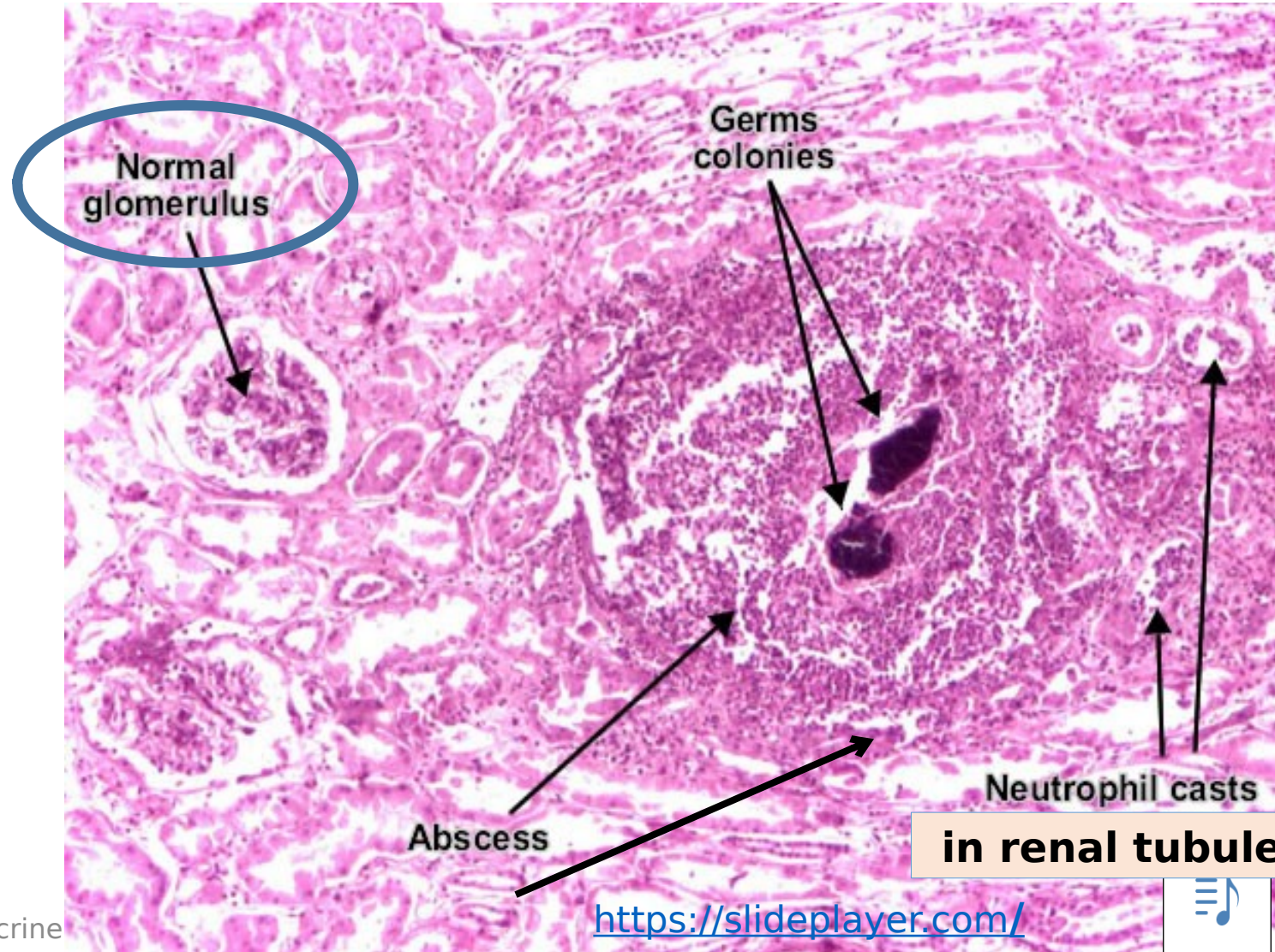
- **Interstitium**

- Dilated capillaries
- Neutrophils, pus cells (abscesses)
- Oedema

- **Tubules:** Inflammation, degeneration and neutrophil casts.

**Pelvic system:**

- Dilated capillaries
- Neutrophils, pus cells



in renal tubules



# Acute pyelonephritis



## Fate

- Mild cases: Recovery
- Severe cases: Acute renal failure
- Some cases:
  - Develop **pyonephrosis** or
  - Progress to **Chronic pyelonephritis**



# Chronic pyelonephritis



## Divided into 2 forms

1. Chronic Obstructive Pyelonephritis

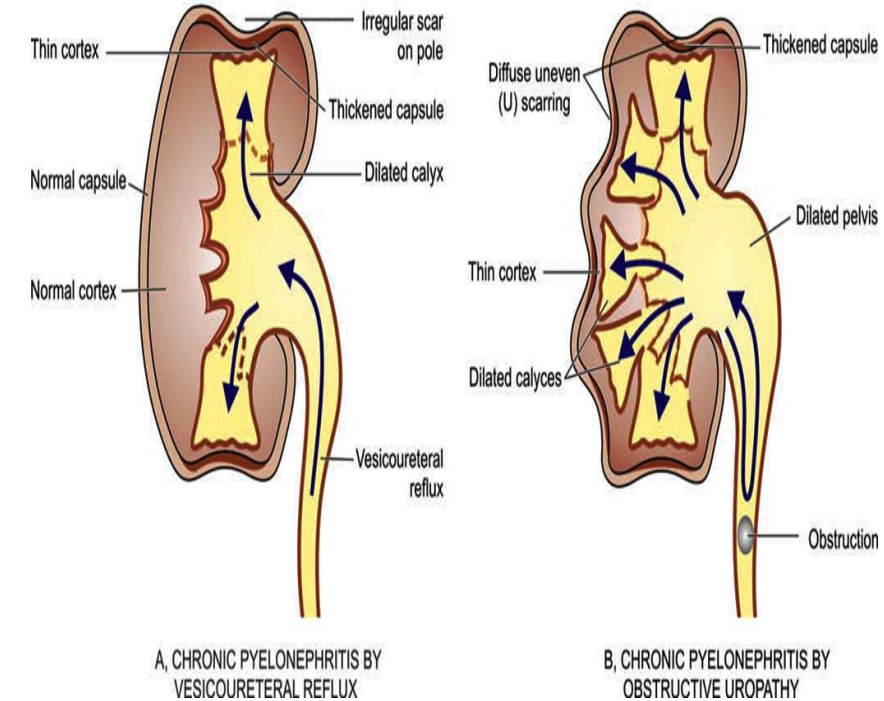
2. Chronic Reflux-Associated Pyelonephritis

(Reflux Nephropathy)

## Characterized by

Scarring of **renal parenchyma**  
& Interstitial inflammation

Scarring of **pelvicalyceal system**  
& its deformity  
**(hallmark)**





# Chronic pyelonephritis



## Commonly bilateral Gross

- **Asymmetrically** contracted  
Kidneys

- Irregular surface depressions  
(scars) to which the capsule  
adherent

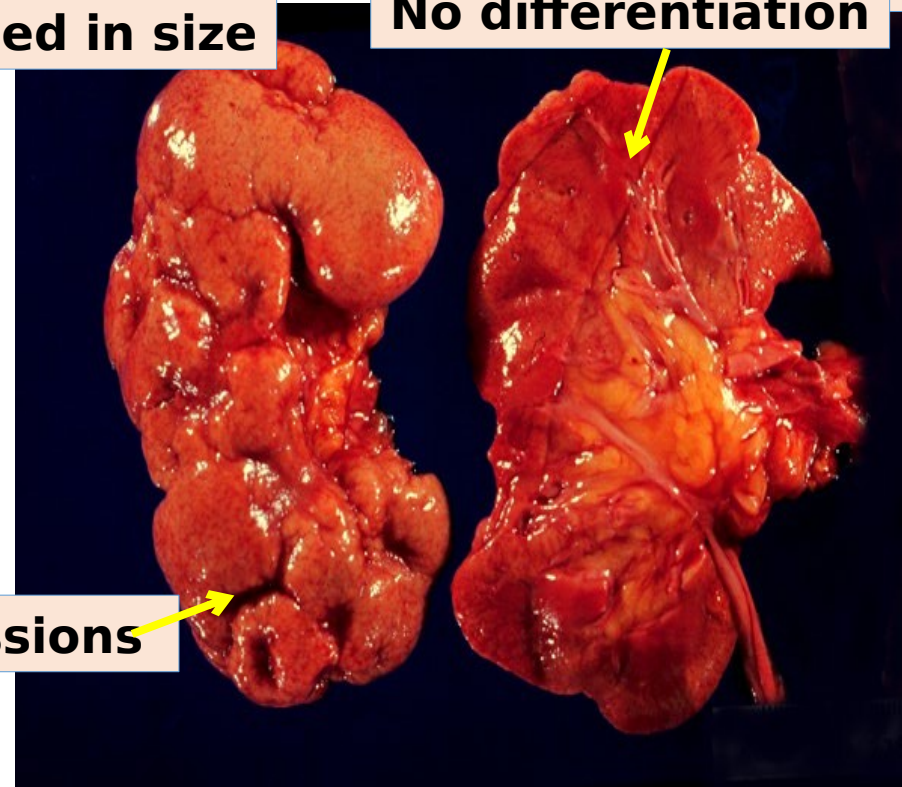
- **NO** differentiation between  
cortex and medulla (both are  
scarred)

Contracted  
= reduced in size

No differentiation

Medulla

Cortex



Depressions



Normal

Chronic pyelonephritis

Normal

[Webpathology.net](https://webpath.med.utah.edu/RENAHTML/RENA.html)

- Scarred & deformed pelvis and

# Chronic pyelonephritis



**Mi**

Chronic inflammatory cells  
In interstitial tissue

## Renal parenchyma

### 1. Periglomerular fibrosis

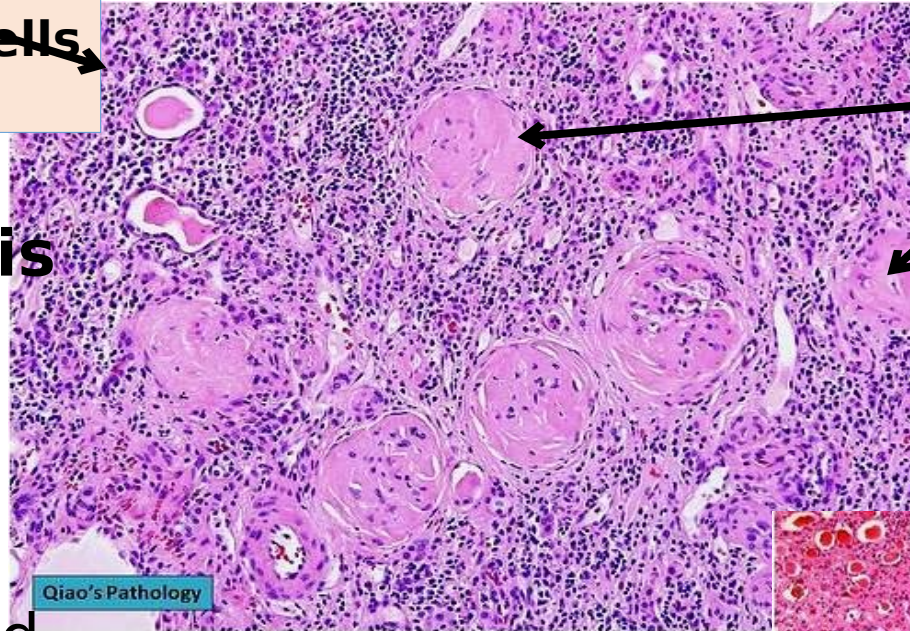
- glomerular ischemia
- glomerular fibrosis

### 2. Tubules

- ❑ Some atrophic
- ❑ Some cystically dilated
- ❑ Some contain pink glassy PAS +ve casts (colloid casts) suggest the appearance of thyroid tissue

### 3. Interstitial tissue

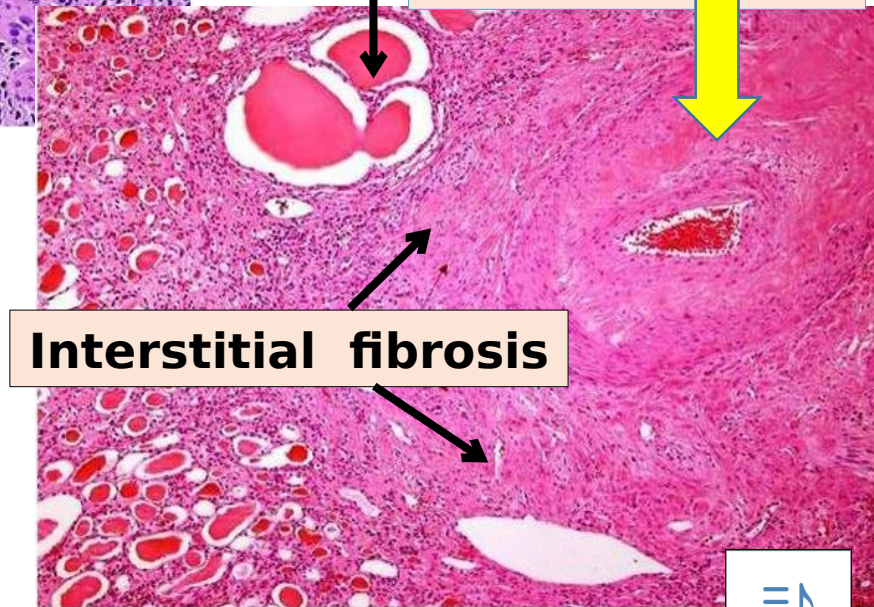
- ❑ Fibrosis
- ❑ Chronic inflammatory cells
- ❑ Endarteritis obliterans



Fibrosed Glomeruli

Thyroidization

Endarteritis obliterans)





# Chronic pyelonephritis



## Pelvicalyceal system:

### Shows chronic inflammation

1. Fibrosis
2. Chronic inflammatory cells (lymphocytes, plasma cells & macrophages)
3. Endarteritis obliterans

## Complications

1. Chronic renal failure
2. Secondary hypertension



# Hydronephrosis



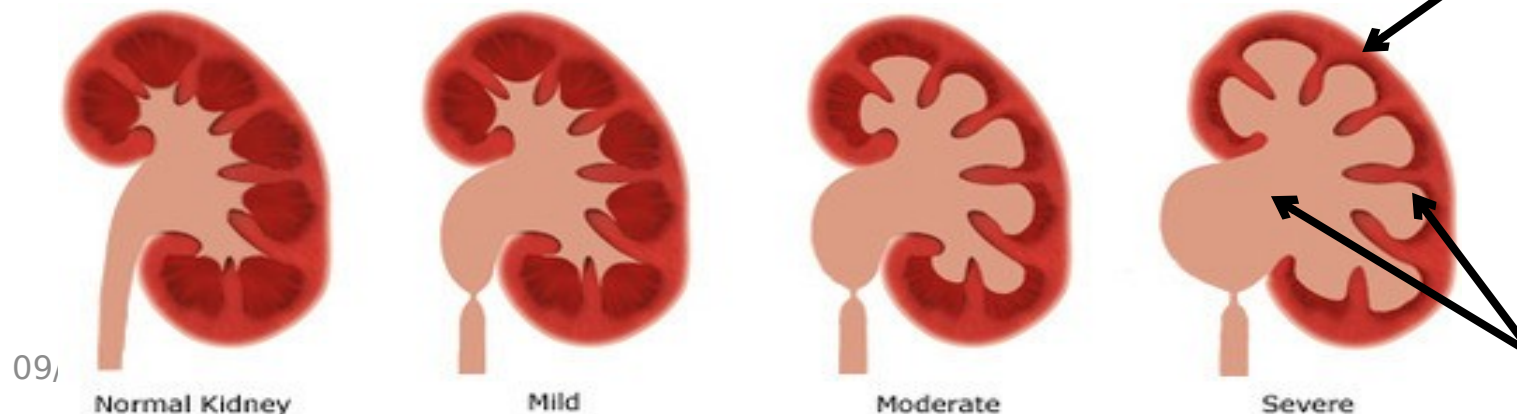
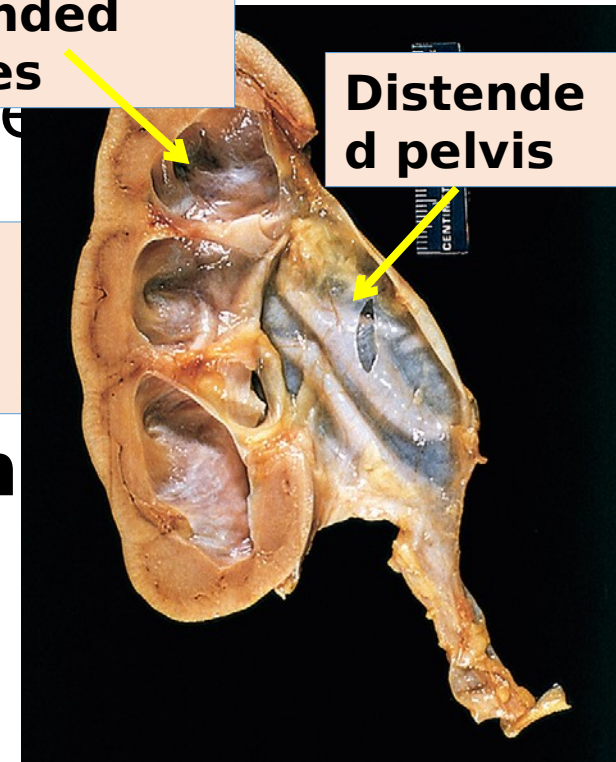
## Definition:

- **Dilation** of the renal pelvis & calyces with accompanying pressure **atrophy** of the renal parenchyma
- Caused by **obstruction** to the outflow of urine
  - At any level of the urinary tract
  - Sudden or insidious
  - Unilateral or bilateral
  - Partial (**usually**) or complete (**sometim**)

Distended calyces

Distended pelvis

Atrophy of renal tissue



Distended pelvis & calyces



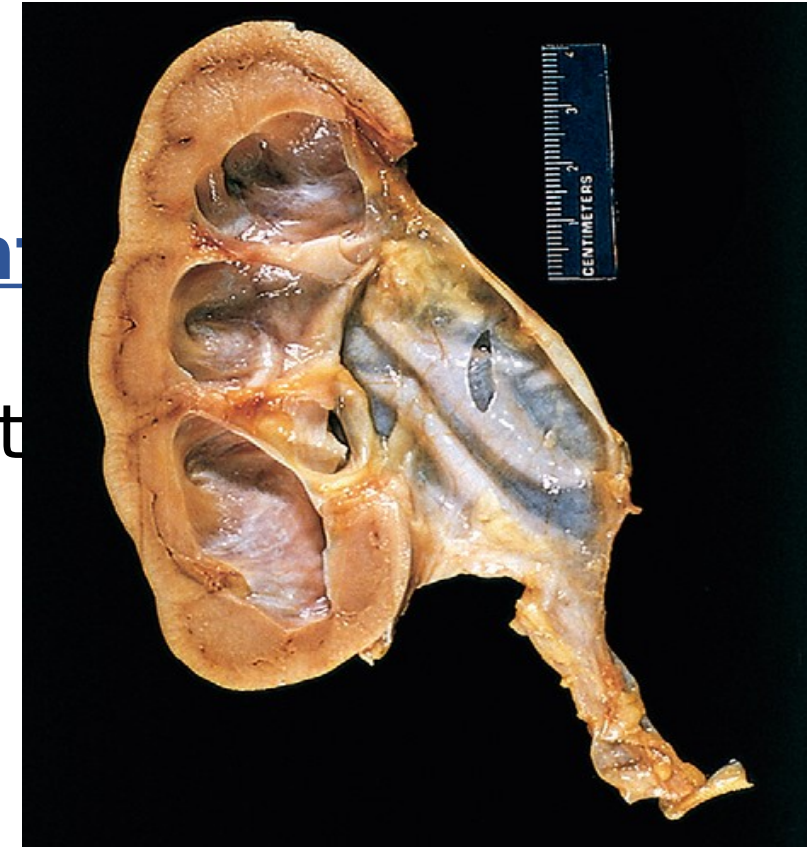
# Hydronephrosis



## N.B:

With partial (incomplete) or intermittent obstruction,

The kidney may be massively enlarged with markedly distended pelvicalyceal system. The renal parenchyma is compressed and atrophied



With sudden and complete obstruction,

Glomerular filtration is compromised relatively early so renal function may stop while dilation is still comparatively slight.





# Hydronephrosis



**Causes:** Obstruction → below level of ureters



## Bilateral Hydronephrosis

### Urethral lesion

#### Congenital

- Stenosis of external urethral meatus

#### Acquired

- Stricture

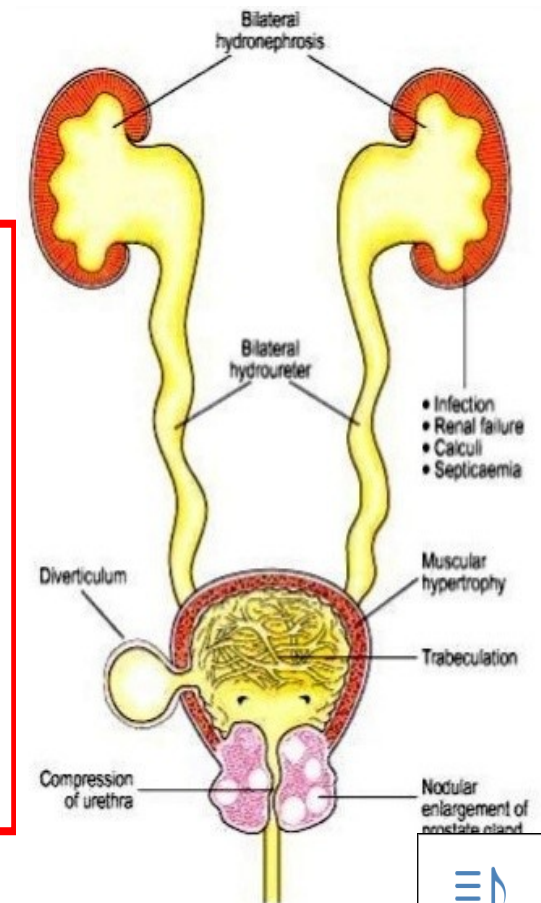
- Tumours

### Prostatic enlargement

- Benign prostatic hyperplasia
- Prostatic Carcinoma

### Bladder neck obstruction

- Stricture
- Tumours
- Stones



# Hydronephrosis



**Causes:** Obstruction → at ureters or above

Unilateral  
Hydronephrosis

## Ureteric lesion

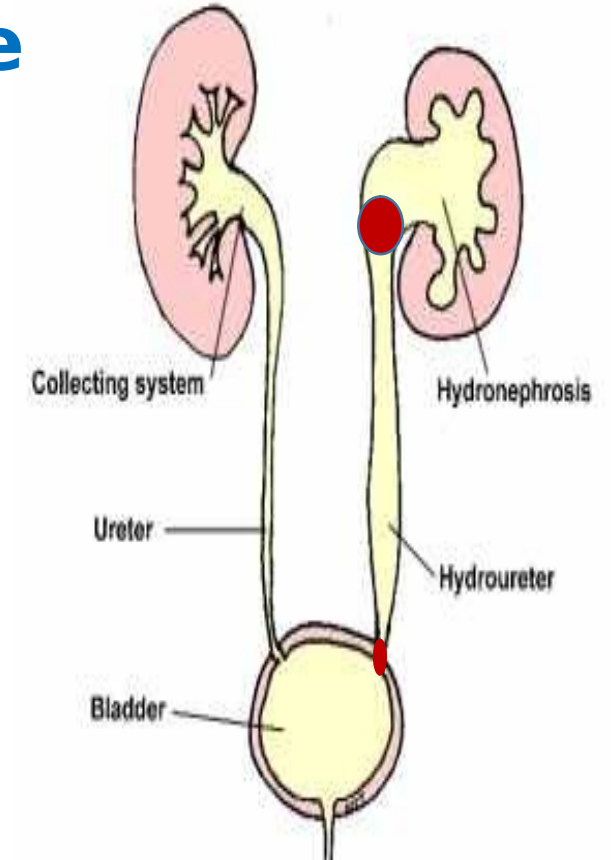
(Unilateral)

- Stricture
- Stone
- Tumours

## Renal pelvis lesion

(Unilateral)

- Stone
- Tumour

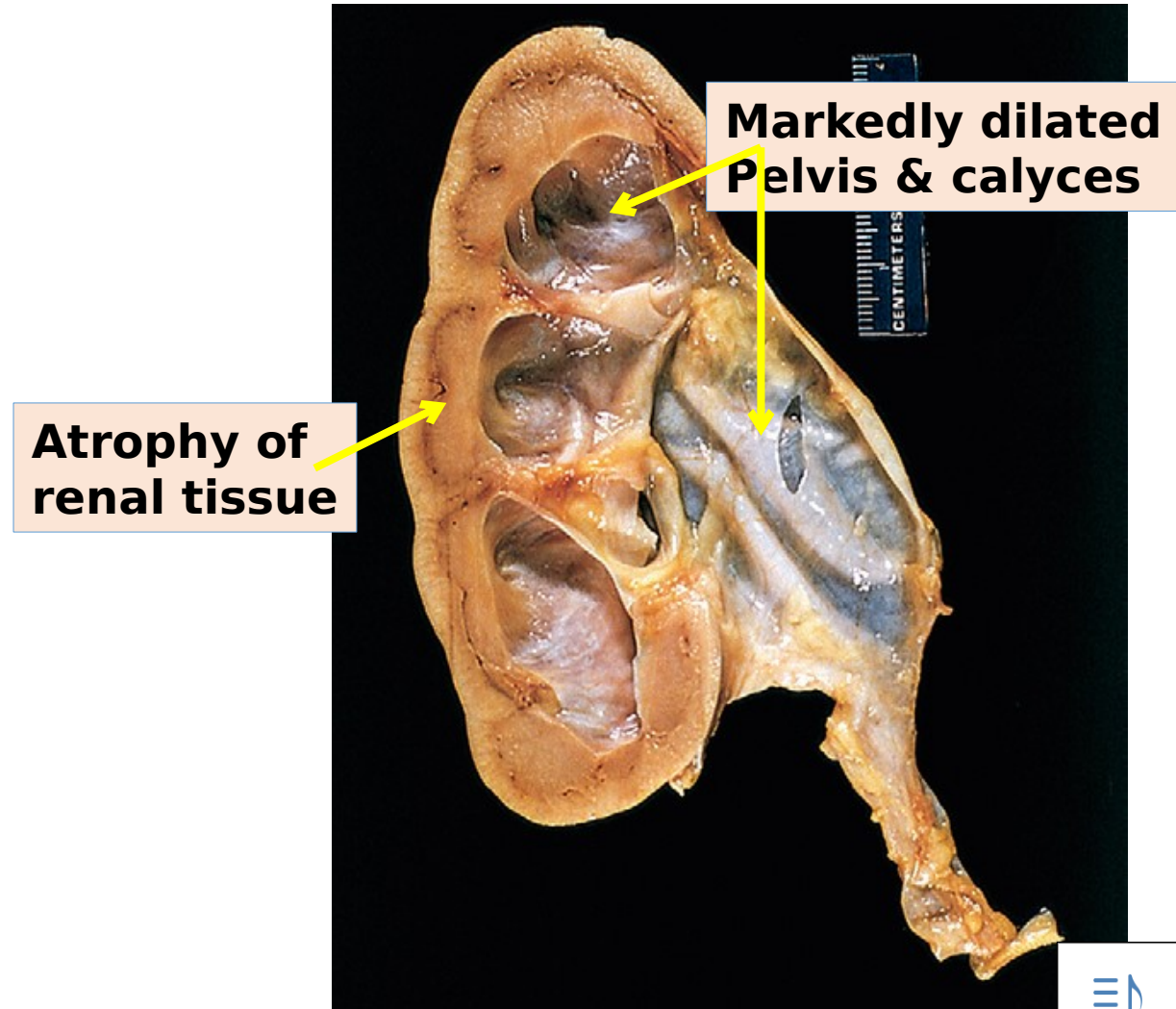


# Hydronephrosis



## Gross

- ❑ Enlarged kidney.
- ❑ Cut section reveals a sac with multiple loculi distended with urine representing markedly dilated pelvis and calyces
- ❑ Atrophy of renal tissue



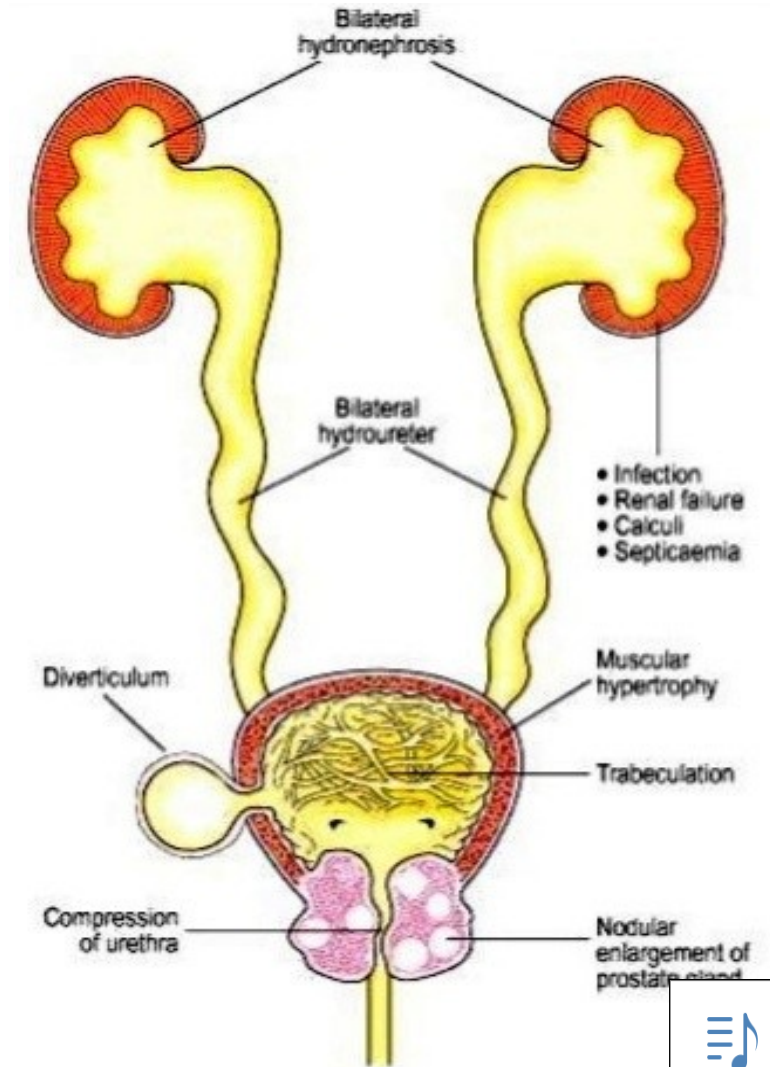
# Hydronephrosis



**N.B:**

**Bilateral hydronephrosis** is associated with

- **Bladder hypertrophy, dilatation and trabeculation**
- Bladder **diverticulæ** (may develop) due to pouching of the mucosa through muscle defects after marked bladder dilatation
- **Bilateral hydroureter** : ureters appear hypertrophied , dilated, elongated and tortuous

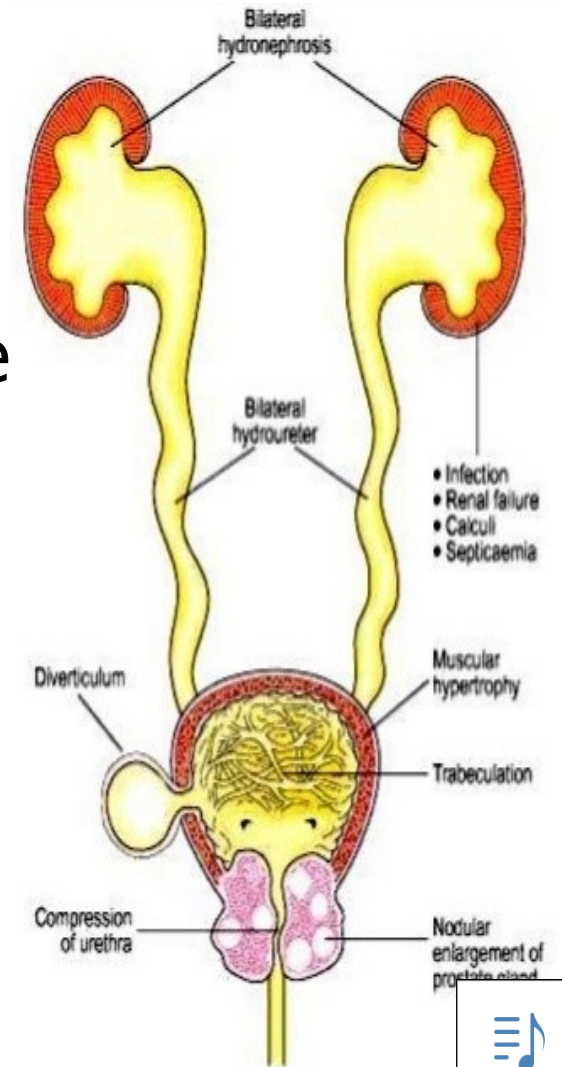


# Hydronephrosis



## Effects:

- ❑ Secondary **infection** → pyonephrosis.
- ❑ Stasis → **stone** formation
- ❑ Bladder diverticula → secondary infection, stone formation, **carcinoma**
- ❑ If hydronephrosis is bilateral → Chronic renal **failure**.
- ❑ Secondary **hypertension**
- ❑ **Pressure** on the surrounding organs





# Pyonephrosis



## Definition:

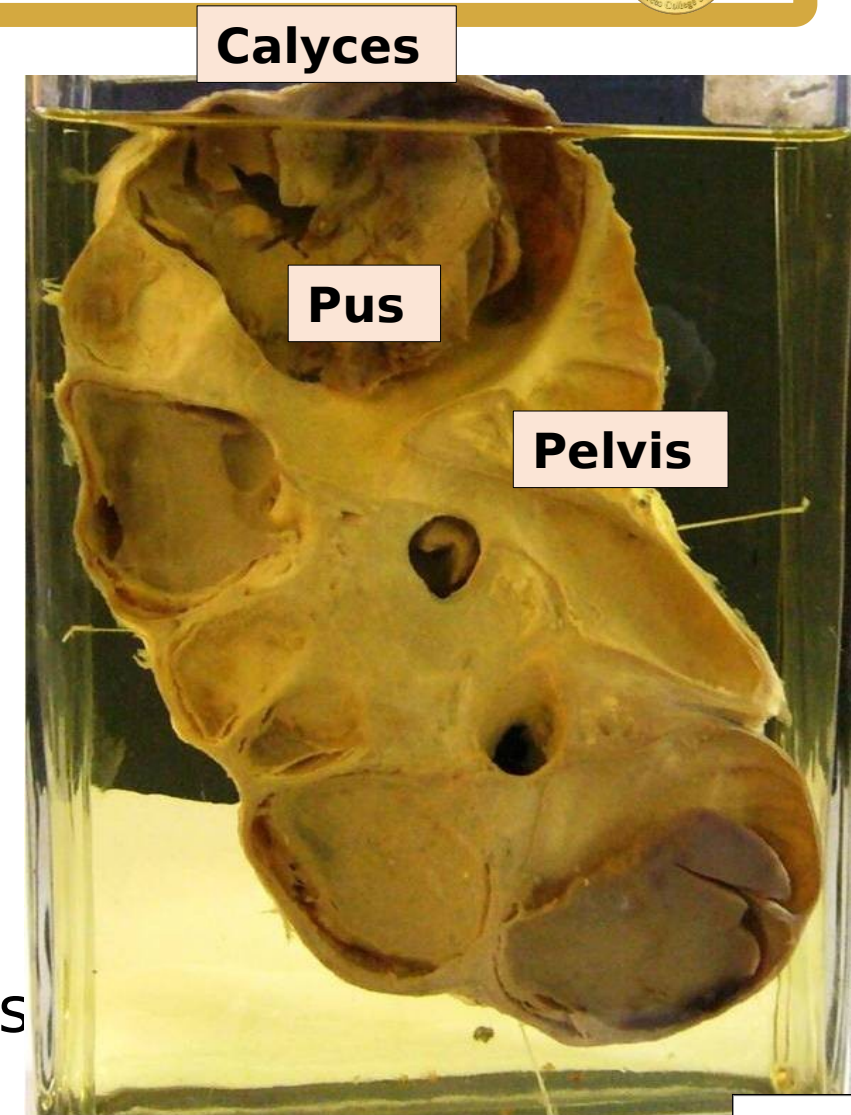
Pelvis and calyces are markedly distended with **pus** → atrophy of renal tissue

## Aetiology

1. **Pyelonephritis** associated with urinary tract obstruction
2. **Hydronephrosis** followed by 2ry infection

## Complications

- Spread of infection to surroundings (perinephritis) → fibrosis & fixation of kidney
- **Chronic renal failure** in **bilateral cases**.



# QUIZ



**Which of the following renal diseases is associated with pyuria?**

- A. Acute post-streptococcal glomerulonephritis
- B. Acute pyelonephritis
- C. Hydronephrosis
- D. Chronic glomerulonephritis

**Which of the following is a pathological feature of chronic pyelonephritis ?**

- A. The kidneys are hugely enlarged and show pelvicalyceal dilatation
- B. The renal capsule can be easily stripped
- C. The renal pelvis is intact
- D. The renal tubules often show thyroid like casts



# QUIZ



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- D. The renal tubules often show thyroid like casts**





## SUGGESTED TEXTBOOKS



1. Robbins basic pathology 10<sup>th</sup> edition, 2018. Chapter 14: Kidney and its collecting system.
2. Kaplan step 1 pathology lecture notes. Chapter 15: Renal pathology; 2017 (P.143-156)



# Thank you



[www.FunScrape.com](http://www.FunScrape.com)

